

120.300: RADIATION SAFETY REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHIC OPERATIONS

120.301: Purpose and Scope

- (A) Establish radiation safety requirements for persons using sources of radiation for industrial radiography,
- (B) Apply to all licensees and registrants who use sources of radiation for industrial radiography,
- (C) Apply to sealed radioactive sources and radiation machines, except for those regulations clearly applicable only to sealed radioactive sources; and,
- (D) Supplement, but do not replace, other applicable requirements of 105 CMR 120.000.

120.302: Definitions

As used in 105 CMR 120.300, the following definitions apply:

Annual Refresher Safety Training means a review conducted or provided by the licensee or registrant for its employees on radiation safety aspects of industrial radiography. The review may include, as appropriate, the results of internal audits, new procedures or equipment, new or revised regulations, accidents or errors that have been observed, and should also provide opportunities for employees to ask safety questions.

ANSI means American National Standards Institute.

Associated Equipment means equipment that is used in conjunction with a radiographic exposure device to make radiographic exposures that drives, guides, or comes in contact with the source, (such as, guide tube, control tube, control cable (drive cable), removable source stop, "J" tube and collimator when it is used as an exposure head)

Cabinet Radiography means industrial radiography conducted in an enclosure or cabinet so shielded that doses to individual members of the public at every location on the exterior meet the limitations specified in 105 CMR 120.221(A).

Cabinet X-Ray System means an x-ray system with the x-ray tube installed in an enclosure which, independent of existing architectural structures except the floor on which it may be placed, is intended to:

- (1) Contain at least that portion of a material being irradiated;
- (2) Provide radiation attenuation; and,
- (3) Exclude personnel from its interior during generation of x radiation.

Included are all x-ray systems designed primarily for the inspection of carry-on baggage at airline, railroad, and bus terminals, and in similar facilities.

An x-ray tube used within a shielded part of a building, or x-ray equipment which may temporarily or occasionally incorporate portable shielding, is not considered a cabinet x-ray system.

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Certification means the authorization by the Massachusetts Radiation Control Program (Agency) of an individual to perform industrial radiography in the Commonwealth of Massachusetts.

Certified Cabinet X-Ray System means an x-ray system which has been certified in accordance with 21 CFR 1010.2 as being manufactured and assembled pursuant to the provisions of 21 CFR 1020.40.

Certified Industrial Radiographer means an individual who has met prescribed training and experience requirements and has passed an approved examination and is authorized by the Agency, pursuant to 105 CMR 120.321(H)(1), to perform industrial radiography.

Certified Industrial Radiographer Trainee means an individual who is authorized by the Agency, pursuant to 105 CMR 120.321(H)(2), to be instructed in industrial radiography and who may perform industrial radiography while under the personal supervision of a Certified Industrial Radiographer or an approved Provisionally Certified Industrial Radiographer.

Collimator means a small radiation shield of lead or other heavy metal which is placed on the end of a guide tube or directly onto a radiographic exposure device to restrict the size of the radiation beam when the sealed source is cranked into position to make a radiographic exposure.

Control Cable (Drive Cable) means the cable that is connected to the source assembly and used to drive the source from and return it to the shielded position.

Control Mechanism (Drive Mechanism) means a device that enables the source assembly to be moved from and returned to the shielded position. A drive mechanism is also known as a crank assembly.

Control tube means a protective sheath for guiding the drive cable. The control tube connects the drive mechanism to the radiographic exposure device.

Crank-Out Device means the cable, protective sheath, and hand crank used to move the sealed source from the shielded to the unshielded position to make an industrial radiographic exposure.

Enclosed Radiography means industrial radiography conducted in an enclosed cabinet or room and includes cabinet radiography and shielded room radiography.

Exposure Head means a device that locates the gamma radiography sealed source in the selected working position. An exposure head is also known as a source stop.

Guide Tube means a flexible or rigid tube, such as a "J" tube, for guiding the source assembly and the attached control cable from the exposure device to the exposure head. The guide tube may also include the connections necessary for attachment to the exposure device and to the exposure head.

I.D. Card means the Agency document issued pursuant to 105 CMR 120.321(C).

Industrial Radiography means the examination of the macroscopic structure of materials by nondestructive methods using sources of radiation derived from radioactive materials or radiation machines. For purposes of 105 CMR 120.300, industrial radiography does not include radiography performed with Lixiscopes or cabinet x-ray systems, nor does it include computed tomography or computer-based digital radiography in which the useful beam of radiation is collimated to detectors.

Industrial Radiography -Radiation Machines means the process of performing industrial radiography using radiation producing machines.

Industrial Radiography -Radioactive Materials means the process of performing industrial radiography using radioactive materials.

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Lay-barge Radiography means industrial radiography performed on any water vessel used for laying pipe.

Lixiscope means a portable light-intensified imaging device using iodine-125 as a sealed source.

Lock-Out Survey means a radiation survey performed to determine that a sealed source is in its shielded position. The lock-out survey is performed before moving the radiographic exposure device or source changer to a new location or securing the radiographic exposure device or source changer.

Offshore Platform Radiography means industrial radiography conducted from a platform over a body of water.

Permanent Radiographic Installation means an installation or structure designed or intended for radiography and in which radiography is regularly performed.

Personal Supervision means supervision provided by a Certified Industrial Radiographer or an approved Provisionally Certified Industrial Radiographer who is physically present at the site where sources of radiation and associated equipment are being used, visually evaluating the performance of the Certified Industrial Radiographer Trainee and in such proximity that immediate assistance can be given if required.

Provisionally Certified Industrial Radiographer means an individual who was employed as an industrial radiographer prior to July 1, 1999 and who is authorized by the Agency, pursuant to 105 CMR 120.321(H)(3), to perform industrial radiography.

Radiation Machine means any device capable of producing ionizing radiation except those which produce radiation only from radioactive material.

Radiation Safety Officer means an individual named by the licensee or registrant who has a knowledge of, responsibility for, and authority to enforce appropriate radiation protection rules, standards, and practices on behalf of the licensee and/or registrant and who meets the requirements of 105 CMR 120.380 and 120.005.

Radiographer means any individual who performs or personally supervises industrial radiographic operations and who is responsible to the licensee or registrant for assuring compliance with the requirements of 105 CMR 120.000 and all license and/or certificate of registration conditions.

Radiographer Trainee means any individual who has successfully completed the training and testing requirements of 105 CMR 120.320(A) and who uses sources of radiation and related handling tools or radiation survey instruments under the personal supervision of a radiographer trainer.

Radiographic Exposure Device means any instrument containing a sealed source fastened or contained therein, in which the sealed source or shielding thereof may be moved, or otherwise changed, from a shielded to unshielded position for purposes of making a radiographic exposure (AKA camera).

Radiographic Personnel means any radiographer or radiographer trainee.

Sealed Source means any radioactive material that is used as a source of radiation and is encased in a capsule designed to prevent leakage or escape of the radioactive material (AKA pill).

Shielded Position means the location within the radiographic exposure device or storage container which, by manufacturer's design, is the proper location for storage of the sealed source.

S-tube means a tube through which the radioactive source travels when inside a radiographic exposure device.

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Shielded-Room Radiography means industrial radiography conducted in a room so shielded that radiation levels at every location on the exterior meet the limitations specified in 105 CMR 120.221(A).

Source Assembly means a component to which the sealed source is affixed or in which the sealed source is contained. The source assembly includes the sealed source (AKA pigtail).

Source Changer means a device designed and used for replacement of sealed sources in radiographic exposure devices, including those source changers also used for transporting and storage of sealed sources.

Storage Area means any location, facility, or vehicle which is used to store, to transport, or to secure a radiographic exposure device, a storage container, or a sealed source when it is not in use and which is locked or has a physical barrier to prevent accidental exposure, tampering with, or unauthorized removal of the device, container, or source.

Storage Container means a device other than a source changer in which sealed sources are stored.

Temporary Job Site means any location where industrial radiography is performed other than the location(s) listed in a specific license or certificate of registration.

Transport Container means a package that is designed to provide radiation safety and security when sealed sources are transported and meets all applicable requirements of the U.S. Department of Transportation.

Underwater Radiography means industrial radiography performed when the radiographic exposure device and/or related equipment are beneath the surface of the water.

120.303: Exemptions

(A) Certified cabinet x-ray systems are exempt from the requirements of 105 CMR 120.300 except for the requirements of 105 CMR 120.337(C) and (D).

(B) Industrial uses of lixiscopes are exempt from the rules in 105 CMR 120.300. Lixiscope use is regulated under 105 CMR 120.100.

120.310: Records of Receipt, Transfer, and Disposal of Sources of Radiation

Each licensee and registrant shall maintain records showing the receipt, transfer, and disposal of sources of radiation. These records shall include the date, the individual making the record, the radionuclide, number of curies, and make, model, and serial number of each source of radiation and device, as appropriate. Records shall be maintained for Agency inspection until disposal is authorized by the Agency.

120.311: Limits on Levels of Radiation for Radiographic Exposure Devices, Source Changers, and Transport Containers

The maximum exposure rate limits for storage containers and source changers are 2 mSv/hr (200 mrem/hr) at any exterior surface, and 0.1 mSv/hr (10 mrem/hr) at 1 meter from any exterior surface with the sealed source in the shielded position.

120.312: Locking of Sources of Radiation

(A) The control panel of each radiation machine shall be equipped with a locking device which will prevent the unauthorized use of an x-ray system or the accidental production of radiation. The radiation machine shall be kept locked and the key removed at all times except when under the direct visual surveillance of a radiographer or radiographer trainee, or an individual specifically authorized by the Agency.

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(B) Each radiographic exposure device, storage container, and source changer shall have a lock or outer lockable container designed to prevent unauthorized or accidental removal or exposure of a sealed source. Each exposure device and source changer shall be kept locked and, if a keyed lock, the key removed at all times except when under the direct visual surveillance of a radiographer or radiographer trainee, or an individual specifically authorized by the Agency.

(C) Each radiographic exposure device, storage container, and source changer shall be locked and the key removed from any keyed lock prior to being transported from one location to another and also prior to being stored at a given location.

(D) The sealed source shall be secured in its shielded position by locking the exposure device or securing the remote control each time the sealed source is returned to its shielded position. Then a survey shall be performed to determine that the sealed source is in the shielded position pursuant to 105 CMR 120.333(B).

120.313: Storage Precautions

(A) Locked radiographic exposure devices, source changers, storage containers, and transport containers that contain sealed sources and radiation machines used in industrial radiography shall be physically secured to prevent tampering or removal by unauthorized personnel.

(B) Radiographic exposure devices, source changers, or transport containers that contain radioactive material shall not be stored in residential locations. This requirement does not apply to storage of radioactive material in a vehicle in transit for use at temporary job sites, if the licensee complies with 105 CMR 120.313(C), and if the vehicle does not constitute a permanent storage location as described in 105 CMR 120.313(D).

(C) If a vehicle is to be used for storage of radioactive material, a vehicle survey shall be performed after securing radioactive material in the vehicle and before transport to ensure that radiation levels do not exceed the limits specified in 105 CMR 120.221(A) at the exterior surface of the vehicle.

(D) A storage or use location is permanent if radioactive material is stored at the location for more than 90 days and any one or more of the following applies to the location:

- (1) Telephone service is established by the licensee;
- (2) Industrial radiographic services are advertised for or from the location;
- (3) Industrial radiographic operations are conducted at other sites due to arrangements made from the location.

120.314: Radiation Survey Instruments

(A) The licensee or registrant shall maintain sufficient calibrated and operable radiation survey instruments to make physical radiation surveys as required by 105 CMR 120.300 and 120.225(A). Instrumentation required by 105 CMR 120.300 shall have a range from 0.02 mSv/hr (2 mrem/hr) through 0.01 Sv/hr (1 rem/hr).

(B) Each radiation survey instrument shall be calibrated:

- (1) By a person licensed or registered by the Agency, another Agreement State, a Licensing State, or the U.S. Nuclear Regulatory Commission to perform such service;
- (2) At energies appropriate for the licensee's or registrant's use;
- (3) At intervals not to exceed six months and after each instrument servicing other than battery replacement;
- (4) To demonstrate an accuracy within plus or minus 20%; and,
- (5) At two points located approximately **a** and **b** of full-scale on each scale for linear scale instruments; at midrange of each decade, and at two points of at least one decade for logarithmic scale instruments; and for digital instruments, at three points between 0.02 and 10 mSv/hr (2 and 1,000 mrem/hr).

(C) Records of these calibrations shall be maintained for Agency inspection for five years after the calibration date.

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(D) Each radiation survey instrument shall be checked with a radiation source at the beginning of each day of use and at the beginning of each work shift to ensure it is operating properly.

120.315: Requirements for Equipment Used in Industrial Radiographic Operations

(A) Conformance with ANSI Standards. Equipment used in industrial radiographic operations shall meet the following minimum criteria:

- (1) Each radiographic exposure device, source assembly, sealed source, and associated equipment shall meet the criteria set forth by ANSI N432-1980.
- (2) Radiation machines manufactured after January 10, 1992 used in industrial radiographic operations shall be certified at the time of manufacture to meet the criteria set forth by ANSI N537- 1976, except accelerators used in industrial radiography.
- (3) All radiographic exposure devices and associated equipment in use after January 10, 1996, must comply with the requirements of 105 CMR 120.315.
- (4) In lieu of subparagraph 105 CMR 120.315(A)(1), equipment used in industrial radiographic operations need not comply with § 8.9.2(c) of the Endurance Test in ANSI N432-1980, if the prototype equipment has been tested using a torque value representative of the torque that an individual using the radiography equipment can realistically exert on the lever or crankshaft of the drive mechanism.
- (5) Engineering analysis may be submitted by a licensee to demonstrate the applicability of previously performed testing on similar individual radiography equipment components. Upon review, the agency may find this an acceptable alternative to actual testing of the component in accordance with 105 CMR 120.315(A)(1).

(B) Labeling.

- (1) Each sealed source or source assembly shall have attached to it or engraved in it a durable, legible, visible label with the words "DANGER. RADIOACTIVE." and a unique serial number. The label shall not interfere with the safe operation of the radiographic exposure device and associated equipment.
- (2) Each radiographic exposure device and transport container shall have permanently attached to it a durable, legible, clearly visible label(s) that has, as a minimum, the standard trefoil radiation caution symbol conventional colors, for example, magenta, purple or black on a yellow background, having a minimum diameter of 25 millimeters, and the following wording "CAUTION. RADIOACTIVE MATERIAL. NOTIFY CIVIL AUTHORITIES (OR NAME OF COMPANY)" or "DANGER. RADIOACTIVE MATERIAL. NOTIFY CIVIL AUTHORITIES (OR NAME OF COMPANY)."
- (3) Each radiographic exposure device shall have attached to it one or more durable, legible, clearly visible labels which show the manufacturer's name, the rated capacity in curies (or becquerels), the mass of the device without removable accessories, and the mass of uranium, if any, used as shielding. The following information about the sealed source shall also be shown: (A) radionuclide chemical symbol and mass number, (B) activity and the date on which this activity was measured, (C) model number and serial number, (D) manufacturer of the sealed source, and (E) licensee's name, address, and telephone number.
- (4) Radiographic exposure devices intended for use as Type B transport containers, shall meet the applicable requirements of 10 CFR Part 71.
- (5) Each vehicle used to transport radioactive material or radiation machines for temporary job site use must display durable, clearly visible placards and/or labels showing the licensee's name, and the city or town where the licensee's main business office is located.
- (6) Modification of any exposure devices and associated equipment is prohibited, unless the design of any replacement component, including source holder, source assembly, controls or guide tubes would not compromise the design safety features of the system.

(C) Performance Requirements. In addition to the requirements specified in 105 CMR 120.315(A) and (B), the following requirements apply to radiographic exposure devices, source assemblies, and associated equipment that allow the source to be moved out of the device for routine operations or to source changers:

- (1) The coupling between the source assembly and the control cable must be designed in such a manner that the source assembly will not become disconnected if cranked outside the guide tube. The coupling must be such that it cannot be unintentionally disconnected under normal and reasonably foreseeable abnormal conditions.

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- (2) The device must automatically secure the source assembly when it is cranked back into the fully shielded position within the device. This securing system may only be released by means of a deliberate operation on the exposure device.
- (3) The outlet fittings, lock box, and drive cable fittings on each radiographic exposure device must be equipped with safety plugs or covers which must be installed during storage and transportation to protect the source assembly from water, mud, sand or other foreign matter.
- (4) Each sealed source or source assembly must have attached to it or engraved on it, a durable, legible, visible label with the words:

"DANGER -- RADIOACTIVE."

The label must not interfere with the safe operation of the exposure device or associated equipment.

- (5) The guide tube must be able to withstand a crushing test that closely approximates the crushing forces that are likely to be encountered during use, and be able to withstand a kinking resistance test that closely approximates the kinking forces that are likely to be encountered during use..
- (6) Guide tubes must be used when moving the source out of the device.
- (7) An exposure head, endcap, or similar device designed to prevent the source assembly from passing out of the end of the guide tube shall be attached to the outermost end of the guide tube during radiographic operations.
- (8) The guide tube exposure head connection must be able to withstand the tensile test for control units specified in ANSI N432-1980.
- (9) Source changers must provide a system for ensuring that the source will not be accidentally withdrawn from the changer when connecting or disconnecting the drive cable to or from a source assembly.

(D) Leak Testing.

- (1) Each sealed source shall be tested for leakage at intervals not to exceed six months. In the absence of a certificate from a transferor indicating that a test has been made within the six-month period prior to the transfer, the sealed source shall not be put into use until tested.
- (2) The leak test shall be capable of detecting the presence of 185 Bq (0.005 microcuries) of removable contamination on the sealed source. An acceptable leak test for sealed sources in the possession of a radiography licensee would be to test at the nearest accessible point to the sealed source storage position, or other appropriate measuring point, by a procedure to be approved pursuant to 105 CMR 120.126(A)(5). Records of leak test results shall be kept in units of becquerels or microcuries and maintained for inspection by the Agency for five years after it is made.
- (3) Any test conducted pursuant to 105 CMR 120.315(D)(1) and (2) which reveals the presence of 185 Bq (0.005 microcuries) or more of removable radioactive material shall be considered evidence that the sealed source is leaking. The licensee shall immediately withdraw the equipment involved from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with regulations of the Agency. Within five days after obtaining results of the test, the licensee shall file a report with the Agency describing the equipment involved, the test results, and the corrective action taken.
- (4) Each exposure device using DU shielding and an "S" tube configuration shall be tested for DU contamination at intervals not to exceed 12 months. The analysis must be capable of detecting the presence of 185 Bq (0.005 microcuries) of radioactive material on the test sample and must be performed by a person specifically authorized by the Commission or an Agreement State to perform the analysis. Should such testing reveal the presence of DU contamination, the exposure device must be removed from use until an evaluation of the wear of the S-tube has been made. Should the evaluation reveal that the S-tube is worn through, the device may not be used again. DU shielded devices do not have to be tested for DU contamination while in storage and not in use. Before using or transferring such a device, however, the device must be tested for DU contamination, if the interval of storage exceeds 12 months. Each licensee shall maintain records of leak testing of sealed sources and devices containing DU. The licensee shall retain each record for agency inspection for five years from the date of the leak test.

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(5) An applicant or licensee who desires to conduct its own tests for leakage or contamination shall establish procedures to be followed when testing sealed sources for leakage or contamination and shall submit a description of such procedures to the Agency for approval. The description shall include the:

- (a) Instrumentation to be used;
- (b) Method of performing the tests; and
- (c) Pertinent experience of the individual(s) who will perform the test.

(E) Limitation. The replacement of any sealed source fastened to or contained in a radiographic exposure device and leak testing, repair, tagging, opening, or any other modification of any sealed source shall be performed only by persons specifically authorized to do so by the Agency, the U.S. Nuclear Regulatory Commission (NRC), or an Agreement State.

120.316: Quarterly Inventory

Each licensee and registrant shall conduct a quarterly physical inventory to account for all sources of radiation received or possessed. Sources of radiation include radiographic exposure devices containing depleted uranium. The inventory records shall be maintained for Agency inspection for five years from the date of the inventory. Records shall include the manufacturer, model number, serial number, radionuclide, number of curies, and location of each source of radiation, the date of the inventory, and name of the individual making the inventory.

120.317: Utilization Logs

Each licensee and registrant shall maintain current logs of the use of each source of radiation. The logs shall include:

- (A) A unique identification (*e.g.*, serial number) of each radiation machine, each radiographic exposure device in which a sealed source is located, and each sealed source;
- (B) The name of the radiographer using the source of radiation;
- (C) The location(s) where each source of radiation is used and dates of use; and,
- (D) The date(s) each source of radiation is removed from storage and returned to storage. For fixed installations, the date(s) each source of radiation is energized or used and the number of exposures made. Utilization logs may be kept on form MRCP 120.300-2, Utilization Log, or on clear, legible records containing all the information required by 105 CMR 120.317(A) through (D). Copies of utilization logs shall be maintained for Agency inspection for five years. The records shall be kept at the location specified by the license or certificate of registration.

120.318: Inspection and Maintenance

(A) Each licensee or registrant shall perform visual and operability checks on survey meters, radiation machines, radiographic exposure devices, transport and storage containers, associated equipment and source changers before use on each day the equipment is to be used to ensure that the equipment is in good working condition, that the sources are adequately shielded, and that required labeling is present. Survey instrument operability must be performed using check sources or other appropriate means. If equipment problems are found, the equipment must be removed from service until repaired.

(B) At least quarterly, each licensee and registrant shall inspect and repair components affecting safety associated with radiation machines, radiographic exposure devices, transport containers, and source changers. These components shall be maintained in accordance with manufacturers' specifications. Records of inspection and maintenance shall be maintained for Agency inspection for five years from the date of the inspection. This program shall cover, as a minimum, the items listed in 105 CMR 120.396: *Appendix B*, and inspection and maintenance necessary to maintain the Type B packaging used to transport radioactive materials. The inspection and maintenance program must include procedures to assure that Type B packages are shipped and maintained in accordance with the certificate of compliance or other approval.

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(C) Records of equipment problems and of any maintenance performed in accordance with 105 CMR 120.318(A) or (B) shall be made and maintained for five years.

120.319: Permanent Radiographic Installations

(A) Permanent radiographic installations shall have high radiation area entrance controls of the type described in 105 CMR 120.227(A)(2) and (3) and (B).

(B) Each entrance that is used for personnel access to the high radiation area shall have both conspicuous visible and audible warning signals to warn of the presence of radiation. The visible signal shall be activated by radiation. The audible signal shall be activated when an attempt is made to enter the installation while the source is exposed.

(C) The control device or alarm system shall be tested for proper operation with a source of radiation at the beginning of each day of equipment use. The test shall include a check for the visible and/or audible signals. Entrance control devices that reduce the radiation level upon entry as described in 105 CMR 120.227(A)(1) shall be tested monthly. If a control device or alarm system is operating improperly, it shall be immediately labeled as defective and repaired within seven calendar days. The facility may continue to be used during this seven-day period, provided the licensee or registrant implements the continuous surveillance requirements of 105 CMR 120.331, ensures that radiographic personnel use an alarming ratemeter, and complies with the requirements of 105 CMR 120.330(B). Records of these tests shall be maintained for Agency inspection for five years.

120.320: Training and Testing

(A) Radiographer Trainee Requirements. The licensee or registrant shall not permit any individual to act as a radiographer trainee unless such individual

- (1) has been certified by the Agency pursuant to 105 CMR 120.321(H)(2) for the class of radiography (*i.e.*, radioactive materials, radiation machines, or both) that the licensee or registrant is authorized to perform and such certification has neither expired nor been suspended or revoked by the Agency;
- (2) has received copies of and instructions in the requirements described in the regulations contained in 105 CMR 120.300 and the applicable sections of 105 CMR 120.100, 120.200, 120.750 , and applicable DOT regulations as referenced in 105 CMR 120.770, a copy of the license or certificate of registration issued to the licensee or registrant and copies of and instructions in the licensee's or registrant's operating and emergency procedures;
- (3) has been instructed in the use of the licensee's or registrant's sources of radiation, radiographic exposure devices, associated equipment, related handling tools and radiation survey instruments that may be employed in industrial radiographic assignments; and,
- (4) has demonstrated, to the satisfaction of the licensee or registrant, an understanding of the instructions provided pursuant to 105 CMR 120.320(A)(2) and (3) as evidenced by successful completion of a written or oral test and a field examination on the subjects covered.

(B) Radiographer Requirements. The licensee or registrant shall not permit any individual to act as a radiographer unless such individual:

- (1) has been certified by the Agency pursuant to 105 CMR 120.321(H)(1) or (3) for the class of radiography (*i.e.*, radioactive materials, radiation machines, or both) that the licensee or registrant is authorized to perform and such certification has neither expired nor been suspended or revoked by the Agency; and,
- (2) has met the requirements of 105 CMR 120.320(A) (2) through (4).

(C) Training and Testing Records. Each licensee and registrant shall maintain, for Agency inspection, training and testing records which demonstrate that the applicable requirements of 105 CMR 120.320(A) and (B) are met for all industrial radiographic personnel. Records shall be kept on form MRCP 120.300-1 or on clear, legible records containing all the information required by form MRCP 120.300-1. Records shall be maintained for inspection by the Agency for three years following termination of employment or until the radioactive material license or certificate of registration is terminated.

120.321: Applications and Examinations

- (A) Any individual applying to the Agency for certification to perform industrial radiography shall:
- (1) submit a complete and legible application on forms prescribed and furnished by the Agency.
 - (2) pay the appropriate non-refundable fee in accordance with 105 CMR 120.321(J) .
 - (3) meet the examination requirements set forth in 105 CMR 120.321(D) or satisfy the requirements for certification based on reciprocity as set forth in 105 CMR 120.321(K); and,
 - (4) provide evidence that the requirements for the given category and class for which certification is sought have been met.
- (B) Application.
- (1) Any individual who seeks Provisional Certification as an industrial radiographer shall submit an application to the Agency no later than July 1, 1999.
 - (2) The appropriate fee shall accompany the application when filing with the Agency. An application shall be deemed filed on the date that it is received by the Agency or on the date that it is postmarked by the United States Postal Service.
- (C) Categories of Certification.
- (1) The Agency shall certify individuals to perform industrial radiography in one or more of the following categories:
 - (a) Certified Industrial Radiographer;
 - (b) Provisionally Certified Industrial Radiographer; or,
 - (c) Certified Industrial Radiographer Trainee.
 - (2) Each certification issued shall include a class endorsement for the type of industrial radiography authorized. Such class endorsements are limited to:
 - (a) Radioactive Materials;
 - (b) Radiation Machines; or
 - (c) Radioactive Materials and Radiation Machines.
- (D) Examination Requirements.
- (1) An individual who seeks certification as a Certified Industrial Radiographer must have passed, prior to application for certification, a written examination appropriate to the category and class of certification sought in accordance with 105 CMR 120.321(E). An individual seeking certification as a Certified Industrial Radiographer after July 1, 1999, must pass, within 12 months prior to application for certification, a written examination appropriate to the category and class of certification sought in accordance with 105 CMR 120.321(G). In the event that this examination is not passed, the individual seeking certification as a Certified Industrial Radiographer may apply, during this 12 month period, for re-examination in accordance with 105 CMR 120.321(D)(4).
 - (2) An individual who holds certification as a Certified Industrial Radiographer Trainee shall take the examination for Certified Industrial Radiographer as prescribed by 105 CMR 120.321(E) within 12 months after certification. In the event that this examination is not passed, the Certified Industrial Radiographer Trainee may apply for re-examination in accordance with 105 CMR 120.321(D)(4).
 - (3) An individual who is a Provisionally Certified Industrial Radiographer shall take the examination for Certified Industrial Radiographer as prescribed by 105 CMR 120.321(E) on or before July 1, 1999. In the event that this examination is not passed, the Provisionally Certified Industrial Radiographer may apply for re-examination in accordance with 105 CMR 120.321(D)(4).
- [AGENCY NOTE: In the event the provisionally certified industrial radiographer does not comply with application or testing requirements of 105 CMR 120.321(D)(3), certification as Provisionally Certified Industrial Radiographer shall expire on July 1, 1999.]
- (4) Application for examination or re-examination shall be on forms prescribed by the Department and shall include the appropriate fee specified by 105 CMR 120.321(J). Examination fees shall be non-refundable.
 - (5) Examinees shall present photographic identification (*e.g.*, drivers license) at the time of examination.

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(E) Examination.

- (1) The Agency shall administer examinations in each class of industrial radiography as specified in 105 CMR 120.321(C)(2) at such times and places as the Agency determines necessary.
 - (a) The examination shall be available through the Conference of Radiation Control Program Directors, Inc.
 - (b) The scaled passing score shall be 70%.
 - (c) A candidate who fails an examination may apply for re-examination in accordance with 105 CMR 120.321(D).
- (2) The Agency shall accept alternative examinations provided that such examinations are found acceptable by the U.S. Nuclear Regulatory Commission.

(F) Approved Training Program. Industrial radiographer training programs shall be approved by the Agency. The Agency shall recognize other programs approved by another state or jurisdiction provided that such programs consist of standards and procedures that are the same or comparable to the standards and procedures established by 105 CMR 120.300. The Agency shall base its approval on information provided by the training program that shall include:

- (1) Curriculum information sufficient to assure inclusion of subjects referenced in 105 CMR 120.395: *Appendix A*;
- (2) Copies of test questions and answers and other evaluation tools and criteria used to demonstrate a participant's comprehension of subject matter in 105 CMR 120.395: *Appendix A*; and,
- (3) Resumes of instructors.

(G) Experience Requirements for Certification. Applicants for certification to perform industrial radiography shall have a minimum of experience appropriate to each category and class of industrial radiography as follows:

- (1) Certified Industrial Radiographer
 - (a) Radioactive Materials..... 200 hrs
 - (b) Radiation Machines 120 hrs
 - (c) Both Radioactive Materials and Radiation 320 hrs
 Machines of which not less than 200 hours shall be with radioactive materials and not less than 120 hours shall be with radiation machines.
- (2) Provisionally Certified Industrial Radiographer
 - (a) Employment as an industrial radiographer prior to July 1, 1999; and,
 - (b) Compliance with the requirements of 105 CMR 120.320(B).
- (3) Certified Industrial Radiographer Trainee. No prior experience required.

(H) Requirements for Issuance of Certification. The Agency shall certify in a category and class of industrial radiography any individual who has satisfied the following requirements:

- (1) Certified Industrial Radiographer
 - (a) Submitted an application for certification on a form prescribed by the Department;
 - (b) Submitted the application fee specified in 105 CMR 120.321(J)(1);
 - (c) Passed an examination as required by 105 CMR 120.321(D)(1) or satisfies the requirements for certification based on reciprocity as set forth in 105 CMR 120.321(K); and,
 - (d) Completed the required hours of experience in industrial radiography as specified in 105 CMR 120.321(G) or satisfies the requirements for certification based on reciprocity as set forth in 105 CMR 120.321(K)
- (2) Certified Industrial Radiographer Trainee
 - (a) Submitted an application for certification on a form prescribed by the Agency;
 - (b) Submitted the application fee specified in 105 CMR 120.321(J)(1); and,
 - (c) Submitted documentation of successful completion of an approved training program as specified in 105 CMR 120.321(F) or satisfies the requirements for certification based on reciprocity as set forth in 105 CMR 120.321(K)

[AGENCY NOTE: Training includes didactic study incorporating those topics included in 105 CMR 120.395: *Appendix A*. Training does not include on-the-job experience.]

120.321: continued

- (3) Provisionally Certified Industrial Radiographer
 - (a) No later than July 1, 1999, submitted an application for certification on a form prescribed by the Agency;
 - (b) Submitted the application fee specified in 105 CMR 120.321(J)(1); and,
 - (c) Submitted documentation that prior to July 1, 1999, the individual was employed as an industrial radiographer and has complied with the requirements of 105 CMR 120.320(B).

[AGENCY NOTE: Examples of acceptable documentation are a written statement from an employer that the applicant is or has been employed as an industrial radiographer or a copy of a radioactive materials license, issued by the Agency or by the regulatory agency having jurisdiction in another state, identifying the applicant as an authorized user of industrial radiography sources.]

(I) Duration of Certification.

- (1) The duration of certification issued by the Agency shall be:

- (a) Certified Industrial Radiographer five years
 - (b) Certified Industrial Radiographer Trainee two years
 - (c) Provisionally Certified Industrial Radiographer

Certification as a Provisionally Certified Industrial Radiographer, issued pursuant to 105 CMR 120.321(H)(3) shall expire on July 1, 1999, provided that the application and testing requirements of 105 CMR 120.321(D)(3) have been met. In the event the provisionally certified industrial radiographer does not comply with application or testing requirements of 105 CMR 120.321(D)(3), certification as Provisionally Certified Industrial Radiographer shall expire on July 1, 1999.

- (2) Certification for Provisionally Certified Industrial Radiographer and Certified Industrial Radiographer Trainee are nonrenewable.

(J) Fees.

- (1) The application fees for examination or certification shall be non-refundable and shall be as follows:

- (a) Each application for examination by the Agency \$75.00
 - (b) Each application for certification:
 - 1. Certified Industrial Radiographer \$50.00
 - 2. Certified Industrial Radiographer Trainee \$50.00
 - 3. Provisionally Certified Industrial Radiographer..... \$50.00

- (2) The appropriate fees shall accompany the application when filing with the Agency.

(K) Reciprocity.

- (1) The Agency shall issue certification to an applicant who has been certified in another state or jurisdiction provided that:

- (a) The applicant holds a valid certification in the appropriate category and class issued by another state or jurisdiction;
 - (b) The standards and procedures for certification in the state or jurisdiction that issued the certification are the same or comparable to the certification standards established by 105 CMR 120.300.
 - (c) The applicant presents a copy of the certification document issued by the other state or jurisdiction to the Agency; and
 - (d) The applicant submits the application fee in accordance with 105 CMR 120.321(J)(1).

- (2) Individuals who are certified by reciprocity shall either:

- (a) Maintain the certification upon which the reciprocal certification was issued; or
 - (b) Satisfy the requirements of 105 CMR 120.321(H) prior to the expiration of the certification upon which reciprocal certification was issued.

(L) Requirements for Renewal of Certification.

- (1) Prerequisites:

- (a) An individual shall submit an application for re-examination and renewal of certification at least six months prior to the expiration date of certification. The Agency shall waive this requirement if the applicant satisfies the requirements of 105 CMR 120.321(A). An individual may not legally perform industrial radiography without valid certification.

120.321: continued

- (b) Each applicant shall submit a complete and legible application with the fee for re-examination and renewal of certification in accordance with 105 CMR 120.321(A).
- (2) Re-examination. Applicants for renewal of certification shall meet the requirements of 105 CMR 120.321(H)(1) including re-examination as described in 105 CMR 120.321(L)(1).
- (3) Certification as a Provisionally Certified Industrial Radiographer is nonrenewable.
- (4) Certification as a Certified Industrial Radiography Trainee is nonrenewable.
- (5) An I.D. card shall be issued to each person who successfully completes the examination prescribed in 105 CMR 120.321(E).
- (6) Each person's I.D. card shall contain his/her photograph. The Agency will take the photograph at the time the examination is administered.
- (7) The I.D. card remains the property of the Commonwealth of Massachusetts and may be revoked or suspended under the provisions of 105 CMR 120.322.
- (8) A fee of \$15.00 shall be paid to the Agency for each replacement of a lost I.D. card.

120.322: Revocation or Suspension of an I.D. Card

- (A) Any radiographer who violates 105 CMR 120.000 may be required to show cause at a formal hearing why his/her I.D. card should not be revoked or suspended.
- (B) When an Agency order has been issued for an industrial radiographer to cease and desist from the use of radioactive material or revoking or suspending his/her I.D. card, the industrial radiographer shall surrender the I.D. card to the Agency until such time as the order is changed or the suspension expires.
- (C) The Agency may act to suspend or revoke an individual's certification for any one or a combination of the following causes:
 - (1) Knowingly causing a material misstatement or misrepresentation to be made in the application for initial certification or renewal of certification if such misstatement or misrepresentation would impair the Agency's ability to assess and evaluate the applicant's qualifications for certification pursuant to 105 CMR 120.321;
 - (2) Knowingly falsifying records of employees when such falsification would impair the Agency's ability to assess and evaluate the applicant's qualifications for certification pursuant to 105 CMR 120.321;
 - (3) Willfully evading the statute or regulations pertaining to certification, or willfully aiding another person in evading such statute or regulations pertaining to certification;
 - (4) Exhibiting significant or repeated incompetence in the performance of industrial radiography duties;
 - (5) Performing industrial radiography in such a manner that requirements of 105 CMR 120.300 are violated resulting in a threat to health and safety of the individual, other workers or the public;
 - (6) Having had a similar certification suspended or revoked if the grounds for that suspension or revocation are the same or equivalent to one or more grounds for suspension or revocation as set forth herein;
 - (7) Failure to maintain the out-of-state certification upon which certification by reciprocity was issued;
- (D) If, based upon any of the grounds in 105 CMR 120.322(C), the Agency determines that action to suspend or revoke certification is warranted, the Agency shall notify the individual and shall provide an opportunity for a hearing in accordance with 801 CMR 1.01 *et seq.* An opportunity for a hearing shall be provided before the Agency takes action to suspend or revoke an individual's certification unless the Agency finds that an immediate suspension of certification is required to protect against immediate danger to the public health or safety, in which case the Agency shall suspend an individual's certification pending a hearing.

120.322: continued

(E) If the Agency finds that removal of certification is warranted, the usual action shall be a suspension of certification for up to one year. The term of suspension may be reduced by the Director of the Radiation Control Program, upon the recommendation of the hearing officer, if the hearing officer finds, based upon evidence presented to him/her during a hearing, that the conditions leading to the Preliminary Order for Suspension can be cured in less than one year. However, if the Agency finds that the causes are of a serious or continuous nature, such as past actions which posed an immediate threat to occupational or public health or safety, deficiencies that cannot be cured within one year, the Agency shall revoke the individual's certification.

(F) When an individual's certification is suspended or revoked, the individual shall surrender his/her certification document to the Agency until the termination of the suspension period or until reissuance of the certification.

(G) An individual whose certification has been revoked may seek reinstatement of certification by filing with the Agency a petition for reinstatement. Such petition may be filed one year or more after the beginning of the revocation period.

120.323: Personnel Monitoring Control

(A) The personnel monitoring program shall meet the applicable requirements of 105 CMR 120.200.

(B) When performing industrial radiographic operations the following shall apply:

- (1) The licensee or registrant shall not permit an individual to act as a radiographer, or radiographer trainee unless each individual wears, on the trunk of the body at all times during radiographic operations, a combination of a direct-reading pocket dosimeter or an electronic personal dosimeter, an alarming ratemeter, and either a film badge, a thermoluminescent dosimeter (TLD), or an optically stimulated luminescence (OSL) dosimeter. At permanent radiography installations where other appropriate alarming or warning devices are in routine use, the wearing of an alarming ratemeter is not required.
- (2) Pocket dosimeters shall meet the criteria in ANSI N13.5-1972 and shall have a range of zero to 200 milliroentgens (zero to 2 mSv).
- (3) Pocket dosimeters shall be recharged at the start of each work shift.
- (4) Exposure indicated by each pocket dosimeter shall be recorded at the beginning of and at the end of each work shift.
- (5) If an individual's pocket dosimeter is discharged beyond its range (*i.e.*, goes "off-scale"), or if an individual's electronic personal dosimeter reads greater than 200 mrem (2 mSv), industrial radiographic operations by that individual shall cease and the individual's film badge, TLD or OSL shall be processed immediately. The individual shall not return to work with sources of radiation until a determination of his/her radiation exposure has been made.
- (6) Each film badge, TLD or OSL shall be assigned to and worn by only one individual.
- (7) If a film badge, TLD or OSL is lost or damaged, the worker shall cease work immediately until a replacement film badge, TLD or OSL is provided and the exposure is calculated for the time period from issuance to loss or damage of the film badge, TLD or OSL.
- (8) Each alarm dosimeter must:
 - (a) Be checked to ensure that the alarm functions properly (sounds) prior to use at the start of each shift.
 - (b) Emit an alarm signal at a preset dose rate of 500 mr/hr (5 mSv/hr).
 - (c) Require special means to change the preset alarm function; and,
 - (d) Be tested at periods not to exceed one year for correct response to radiation. Acceptable dosimeters must alarm within plus or minus 20% of the true radiation dose rate.

(C) Records of pocket dosimeter readings of personnel exposures shall be maintained for five years by the licensee or registrant for Agency inspection. If the dosimeter readings were used to determine external radiation dose (*i.e.*, no TLD, OSL or film badge exposure records exist), the records shall be maintained until the Agency authorizes disposal.

120.323: continued

(D) Pocket dosimeters shall be checked for correct response to radiation at periods not to exceed one year. Acceptable dosimeters shall read within plus or minus 20% of the true radiation exposure. Records of pocket dosimeter calibrations shall be maintained for five years by the licensee or registrant for Agency inspection.

(E) Processors of film badge, TLD and OSL devices must be certified by the NVLAP.

120.330: Operating and Internal Audit Requirements

(A) (1) Each licensee and registrant shall conduct an internal audit program to ensure that the regulations in 105 CMR 120.300, the conditions of license(s) and/or certificate(s) of registration, and the licensee's or registrant's operating and emergency procedures are followed by radiographic personnel. These internal audits shall be performed and recorded at intervals not to exceed six months.

(2) Each individual radiographer's performance shall be audited at intervals not to exceed six months, excepting intervals when the radiographer performs no radiography. If a radiographer has not performed radiography during a six month period, his/her performance must be audited immediately upon his/her resumption to radiography. Records of audits shall be maintained by the licensee or registrant for Agency inspection for five years from the date of the audit.

(3) The agency may consider alternatives in those situations where the individual serves as both radiographer and RSO.

(4) In those operations where a single individual serves as both radiographer and RSO, and performs all radiography operations, an inspection program is not required.

(5) Each licensee shall provide annual refresher safety training for each radiographer and radiographer trainee at intervals not to exceed 12 months.

(B) Each licensee and registrant shall provide, as a minimum, two radiographic personnel when sources of radiation are used at temporary job sites. If one of the personnel is a radiographer trainee, the other radiographic personnel must be a radiographer.

(C) Collimators shall be used in industrial radiographic operations which use crank-out devices except when physically impossible.

(D) No individual other than a radiographer or a radiographer trainee who is under the personal supervision of a radiographer shall manipulate controls or operate equipment used in industrial radiographic operations.

120.331: Security in Field Operations

(A) During each industrial radiographic operation, a radiographer or radiographer trainee shall maintain visual surveillance of the operation to protect against unauthorized entry into a radiation area or high radiation area, except where the high radiation area is equipped with a control device or alarm system as described in 105 CMR 120.227(A) or (B).

(B) Radiographic exposure devices shall not be left unattended except when in storage or physically secured against unauthorized removal.

(C) The sealed source shall be secured and immobilized in its shielded position in the radiographic exposure device with an appropriate locking or latching mechanism each time the sealed source is returned to its shielded position.

(D) Notwithstanding the requirements of 105 CMR 120.243(A), High Radiation Area warnings may be placed at the periphery of the Radiation Area, or at the perimeter of access control.

120.332: Posting

Areas in which industrial radiography is being performed shall be posted conspicuously in accordance with 105 CMR 120.200 including:

120.332: continued

(A) Radiation Areas. Each radiation area shall be posted conspicuously with a sign or signs displaying the radiation symbol and the words:

CAUTION (OR DANGER)

RADIATION AREA

Radiation area means any area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.05 mSv (0.005 rem) in one hour at 30 centimeters from the source of radiation or from any surface that the radiation penetrates.

(B) High Radiation Area. Each high radiation area shall be posted conspicuously with a sign or signs displaying the radiation symbol and the words:

CAUTION (OR DANGER)

HIGH RADIATION AREA

High Radiation Area means an area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 1 mSv (0.1 rem) in 1 hour at 30 centimeters from any source of radiation or from any surface that the radiation penetrates.

(C) Ropes and/or barriers shall be used as necessary to prevent unauthorized entry to radiation areas.

(D) Notwithstanding the requirements of 105 CMR 120.242(A), each radiation area may be posted in accordance with 105 CMR 120.242(B), *i.e.*, High Radiation Area warnings may be placed at the periphery of the controlled area.

120.333: Radiation Surveys and Survey Records

(A) No radiographic operation shall be conducted unless at least one calibrated and operable radiation survey meter, as described in 105 CMR 120.314, is available and used at each site where radiographic exposures are made.

(B) A survey with a radiation survey instrument shall be made after each radiographic exposure to determine that the sealed source has been returned to its shielded position. The entire circumference of the radiographic exposure device, including the source guide tube and collimator if provided, shall be surveyed.

(C) A survey shall be made of the storage area as defined in 105 CMR 120.302 whenever a radiographic exposure device is being placed in storage.

(D) A physical radiation survey shall be made after each radiographic exposure using radiation machines to determine that the machine is "off."

(E) (1) All potential radiation areas in which industrial radiographic operations are to be performed shall be posted in accordance with 105 CMR 120.332, based on calculated dose rates, before industrial radiographic operations begin. An area survey shall be performed during the first radiographic exposure (*i.e.*, with the sealed source in the exposed position) to confirm that 105 CMR 120.332 requirements have been met and that unrestricted areas do not have radiation levels in excess of the limits specified in 105 CMR 120.221(A). Surveys to confirm the extent of the High Radiation Area, 1 mSv/hr (100 mr/hr), within the Radiation Area should not be undertaken.
 (2) Each time the exposure device is relocated and/or the exposed position of the sealed source is changed, the requirements of 105 CMR 120.333(E)(1) shall be met.
 (3) The requirements of 105 CMR 120.333(E)(2) do not apply to pipeline industrial radiographic operations when the conditions of exposure including, but not limited to, the radiographic exposure device, duration of exposure, source strength, pipe size, and pipe thickness remain constant.

120.333: continued

(F) A survey with a radiation survey instrument shall be made to determine that the sealed source has been returned to its shielded position any time a radiographic exposure device is placed in storage. The entire circumference of the radiographic exposure device, including the source guide tube and collimator if provided, shall be surveyed.

(G) If a vehicle is to be used for storage of radioactive material, a vehicle survey shall be performed after securing radioactive material in the vehicle and before transport to ensure that radiation levels do not exceed the limits specified in 105 CMR 120.221(A) at the exterior surface of the vehicle.

(H) Surveys shall be performed on storage containers to ensure that radiation levels do not exceed the limits specified in 105 CMR 120.221(A). These surveys shall be performed initially with the maximum amount of radioactive material present in the storage location and thereafter at the time of the quarterly inventory and whenever storage conditions change.

(I) A survey meeting the requirements of 105 CMR 120.333(F) shall be performed on the radiographic exposure device and the source changer after every sealed source exchange.

(J) Records shall be kept of the surveys required by 105 CMR 120.333(E), (F), (G), (H), (I) and 105 CMR 120.318(A). These records shall be maintained for Agency inspection for five years after completion of the survey. If a survey was used to determine an individual's exposure due to loss of personnel monitoring data, the records of the survey shall be maintained until the Agency authorizes disposal.

120.334: Records Required at Temporary Job Sites

Each licensee and registrant conducting industrial radiography at a temporary job site shall have the following records available at that site for Agency inspection:

- (A) The appropriate license or certificate of registration or equivalent document;
- (B) The appropriate operating and emergency procedures;
- (C) The applicable Agency rules;
- (D) The survey records required pursuant to 105 CMR 120.333 for the period of operation at the site;
- (E) The daily pocket dosimeter records for the period of operation at the site; and,
- (F) The most recent records of instrument and device calibration and source leak tests. Acceptable records include tags or labels which are attached to the devices or survey instruments and decay charts for sources which have been manufactured within the last six months.

120.337: Special Requirements and Exemptions for Enclosed Radiography

(A) Systems for enclosed radiography, including shielded-room radiography and cabinet x-ray systems not otherwise exempted, shall comply with all applicable requirements of 105 CMR 120.300.

(B) Systems for enclosed radiography designed to allow admittance of individuals shall be evaluated at intervals not to exceed one year to ensure compliance with the applicable requirements of 105 CMR 120.300, 120.221(A) and 120.222. Records of these evaluations shall be maintained for Agency inspection for five years after the evaluation.

(C) Certified cabinet x-ray systems are exempt from the requirements of 105 CMR 120.300 except that:

- (1) The registrant shall comply with the requirements of 105 CMR 120.020 and 120.200.

120.337: continued

(2) Tests for proper operation of interlocks must be conducted and recorded in accordance with 105 CMR 120.319. Records of these tests shall be maintained for Agency inspection until disposal is authorized by the Agency.

(3) The registrant shall perform an evaluation to determine compliance with 21 CFR 1020.40 at intervals not to exceed one year. Records of these evaluations shall be maintained for Agency inspection for five years after the evaluation.

(D) Certified cabinet x-ray systems shall be maintained in compliance with 21 CFR 1020.40 and no modification may be made to the system unless prior agency approval has been granted by the Agency pursuant to 105 CMR 120.020.

120.340: Underwater and Lay-barge Radiography

(A) Underwater and/or lay-barge radiography shall not be performed unless specifically authorized in a license issued by the agency in accordance with 105 CMR 120.360.

(B) In addition to the other requirements of 105 CMR 120.300, the following requirements apply to the performance of lay-barge radiography:

(1) Cobalt-60 sources with activities in excess of 740 GBq (20 Ci) (nominal) and iridium-192 sources with activities in excess of 3.70 TBq (100 Ci) (nominal) shall not be used in the performance of offshore platform or lay-barge radiography.

(2) Collimators shall be used for all industrial radiographic operations performed on lay-barges.

120.350: Prohibitions

(A) Industrial radiography performed with a sealed source that is not fastened to or contained in a radiographic exposure device (fishpole technique) is prohibited unless specifically authorized in a license issued by the agency.

(B) Retrieval of disconnected sources or sources that cannot be returned by normal means to a fully shielded position or automatically secured in the radiographic exposure device, shall not be performed unless specifically authorized by a license condition.

120.360: Licensing and Registration Requirements for Industrial Radiographic Operations

(A) The use of sealed sources in industrial radiographic operations shall be licensed in accordance with 105 CMR 120.100.

(B) The use of radiation machines in industrial radiographic operations shall be registered in accordance with 105 CMR 120.020.

(C) In addition to the licensing requirements in 105 CMR 120.100 and the registration requirements in 105 CMR 120.020, an application for a license or certificate of registration shall include the following information:

(1) A schedule or description of the program for training radiographic personnel which specifies:

(a) Initial training;

(b) Annual refresher training;

(c) On-the-job training; and,

(d) Methods to be used by the licensee or registrant to determine the knowledge, understanding, and ability of radiographic personnel to comply with Agency rules, licensing or registration requirements, and the operating and emergency procedures of the applicant.

(2) Written operating and emergency procedures, including all items listed in 105 CMR 120.398: *Appendix D*.

(3) A description of the internal inspection system or other management control to ensure that radiographic personnel follow license or registration provisions, rules of the Agency, and the applicant's operating and emergency procedures;

120.360: continued

(4) A list of permanent radiographic installations and descriptions of permanent storage and use locations. Radioactive material shall not be stored at a permanent storage location or used at a permanent use location unless such storage or use location is specifically authorized by the license. A storage or use location is permanent if radioactive material is stored at the location for more than 90 days and any one or more of the following applies to the location:

- (a) Telephone service is established by the licensee;
- (b) Industrial radiographic services are advertised for or from the location;
- (c) Industrial radiographic operations are conducted at other sites due to arrangements made from the location;

(5) A description of the organization of the industrial radiographic program, including delegations of authority and responsibility for operation of the radiation safety program; and,

(6) A description of the program for inspection and maintenance of radiographic exposure devices and transport and storage containers (including applicable items in 105 CMR 120.318 and 120.396: *Appendix B*)

(7) If a license application includes offshore platform and/or lay-barge radiography, as a minimum a description of:

- (a) transport procedures for radioactive material to be used in industrial radiographic operations;
- (b) storage facilities for radioactive material; and,
- (c) methods for restricting access to radiation areas.

(8) A description of procedures for verifying and documenting the certification status of radiographers and for ensuring that the certification of individuals acting as radiographers remains valid.

(D) A license will be issued if the requirements of 105 CMR 120.100 and 120.360 are met.

(E) A certificate of registration will be issued if the requirements of 105 CMR 120.020 and 120.360 are met.

120.380: Radiation Safety Officer

(A) A radiation safety officer (RSO) shall be designated for every license and certificate of registration issued by the Agency.

(B) The RSO's qualifications shall include:

- (1) Possession of a high school diploma or a certificate of high school equivalency based on the GED test;
- (2) Completion of the training and testing requirements of 105 CMR 120.320(A) and 120.320(B)(3), (4), and (5); and,
- (3) Two years of documented experience related to radiation protection, including knowledge of industrial radiographic operations.

(C) The specific duties of the RSO include, but are not limited to, the following:

- (1) To establish and oversee operating, emergency, and ALARA procedures, and to review them regularly to ensure that the procedures are current and conform with these rules;
- (2) To oversee and approve all phases of the training program for radiographic personnel so that appropriate and effective radiation protection practices are taught;
- (3) To ensure that required radiation surveys and leak tests are performed and documented in accordance with 105 CMR 120.000, including any corrective measures when levels of radiation exceed established limits;
- (4) To ensure that personnel monitoring devices are calibrated and used properly by occupationally-exposed personnel, that records are kept of the monitoring results, and that timely notifications are made as required by 105 CMR 120.200;
- (5) To ensure that any required interlock switches and warning signals are functioning and that radiation signs, ropes, and barriers are properly posted and positioned;
- (6) To investigate and report to the Agency each known or suspected case of radiation exposure to an individual or radiation level detected in excess of limits established by these rules and each theft or loss of source(s) of radiation, to determine the cause, and to take steps to prevent its recurrence;

120.380: continued

- (7) To have a thorough knowledge of management policies and administrative procedures of the licensee or registrant;
- (8) To assume control and have the authority to institute corrective actions including shutdown of operations when necessary in emergency situations or unsafe conditions;
- (9) To maintain records as required by 105 CMR 120.000 (*see* 105 CMR 120.397: *Appendix C*).
- (10) To ensure the proper storing, labeling, transport, and use of exposure devices and sources of radiation;
- (11) To ensure that quarterly inventory and inspection and maintenance programs are performed in accordance with 105 CMR 120.316 and 120.318; and,
- (12) To ensure that personnel are complying with 105 CMR 120.000, the conditions of the license or the registration, and the operating and emergency procedures of the licensee or registrant.

120.385: Notification of Incidents

- (A) The Agency shall be notified of the loss or theft of sources of radiation, overexposures, and excessive levels in accordance with 105 CMR 120.281, 21.1202, 120.282, 120.283, and 120.288.
- (B) In addition, each licensee or registrant shall submit a written report within 30 days to the Agency whenever one of the following events occurs:
 - (1) A source assembly cannot be returned to the fully-shielded position and properly secured;
 - (2) The source assembly becomes unintentionally disconnected from the drive cable;
 - (3) Any component critical to safe operation of the radiographic exposure device fails to properly perform its intended function; or,
 - (4) An indicator on a radiation-producing machine fails to show that radiation is being produced, an exposure switch fails to terminate production of radiation when turned to the off position, or a safety interlock fails to terminate x-ray production.
- (C) The licensee or registrant shall include the following information in each report submitted in accordance with 105 CMR 120.385(B):
 - (1) A description of the equipment problem;
 - (2) Cause of each incident, if known;
 - (3) Manufacturer and model number of equipment involved in the incident;
 - (4) Location, time, and date of the incident;
 - (5) Actions taken to establish normal operations;
 - (6) Corrective actions taken or planned to prevent recurrence; and,
 - (7) Names of personnel involved in the incident.

120.390: Reciprocity

All reciprocal recognition of licenses and certificates of registration by the Agency will be granted in accordance with 105 CMR 120.190 and 120.033.

120.395: Appendix A -- Subjects for Instruction of Radiographer Trainees

Training provided to qualify individuals as radiographer trainees in compliance with 105 CMR 120.320(A) shall be presented on a formal basis. The training shall include the following subjects:

- I. Fundamentals Of Radiation Safety
 - A. Characteristics of radiation
 - B. Units of radiation dose (sievert, rem) and quantity of radioactivity (becquerel, curie)
 - C. Significance of radiation dose
 - 1. Radiation protection standards
 - 2. Biological effects of radiation dose
 - 3. Review of case histories of radiography accidents

120.395: continued

- D. Levels of radiation from sources of radiation
- E. Methods of controlling radiation dose
 - 1. Working time
 - 2. Working distances
 - 3. Shielding
- II. Radiation Detection Instrumentation To Be Used
 - A. Use of radiation survey instruments
 - 1. Operation
 - 2. Calibration
 - 3. Limitations
 - B. Survey techniques
 - C. Use of personnel monitoring equipment
 - 1. Film badges
 - 2. TLD's
 - 3. OSL's
 - 4. Pocket dosimeters
 - 5. Alarming ratemeters
 - 6. Electronic personal dosimeters
- III. The Requirements Of Pertinent Federal And Commonwealth Regulations
- IV. The Licensee's Or Registrant's Written Operating And Emergency Procedures
- V. Radiographic Equipment To Be Used
 - A. Remote handling equipment
 - B. Operation and control of radiographic exposure devices and sealed sources, including pictures or models of source assemblies (pigtailed)
 - C. Storage and transport containers, source changers
 - D. Equipment maintenance
 - E. Operation and control of x-ray equipment
 - F. Collimators

120.396: Appendix B -- General Requirements for Inspection of Industrial Radiographic Equipment

I. Panoramic devices (devices in which the sealed source is physically removed from the shielded container during exposure) shall be inspected for:

- A. Radiographic exposure unit
 - 1. Abnormal surface radiation levels anywhere on camera, collimator, or guide tube
 - 2. Condition of safety plugs
 - 3. Proper operation of locking mechanism
 - 4. Condition of pigtail connector
 - 5. Condition of carrying device (straps, handle, etc.)
 - 6. Proper labeling
- B. Source tube
 - 1. Rust, dirt, or sludge buildup inside the source tube
 - 2. Condition of source tube connector
 - 3. Condition of source stop
 - 4. Kinks or damage that could prevent proper operation
 - 5. Presence of radioactive contamination
- C. Control cables and drive mechanism
 - 1. Proper drive mechanism with camera, as appropriate
 - 2. Changes in general operating characteristics
 - 3. Condition of connector on drive cable
 - 4. Drive cable flexibility, wear, and rust
 - 5. Excessive wear or damage to crank assembly parts
 - 6. Damage to drive cable conduit that could prevent the cable from moving freely
 - 7. Connection of the control cable connector with the pigtail connector for proper mating
 - 8. Proper operation of source position indicator, if applicable
 - 9. Presence of radioactive contamination

II. Directional beam devices shall be inspected for:

- A. Abnormal surface radiation
- B. Changes in the general operating characteristics of the unit
- C. Proper operation of shutter mechanism
- D. Chafing or binding of shutter mechanism
- E. Damage to the device which might impair its operation
- F. Proper operation of locking mechanism
- G. Proper drive mechanism with camera, as appropriate
- H. Condition of carrying device (strap, handle, etc.)
- I. Proper labeling

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120.397: Appendix C -- Time Requirements for Record Keeping

<u>Specific Section</u>	<u>Name of Record</u>	<u>Time Interval Required for Record Keeping</u>
105 CMR 120.310	Receipt, Transfer and Disposal	Until the radioactive material license or certificate of registration is terminated
105 CMR 120.314	Survey Instrument Calibration	five years
105 CMR 120.315	Leakage or Contamination Tests	five years
105 CMR 120.316	Quarterly Inventory	five years
105 CMR 120.317	Utilization Logs	five years
105 CMR 120.318	Quarterly Inspection and Maintenance	five years
105 CMR 120.319	High Radiation Area Control	five years
105 CMR 120.320	Training and Testing Records	Until the radioactive material license or certificate of registration is terminated. Three years after termination of employment
105 CMR 120.330	Internal Audit Program	five years
105 CMR 120.323	Pocket Ionization Chamber (i.e., Pocket Dosimeter) Calibrations	five years
105 CMR 120.323	Personnel Monitoring Records Pocket Ionization Chamber (i.e., Pocket Dosimeter) Readings	Until the radioactive material license or certificate of registration is terminated
105 CMR 120.323	Alarm dosimeter Calibrations	five years
105 CMR 120.333	Radiation Surveys	five years or until the radioactive material license or certificate of registration is terminated if a survey was used to determine an individual's exposure
105 CMR 120.334	Records at Temporary Job Sites	During temporary job site operations
105 CMR 120.337	Initial and Annual Evaluation of Enclosed Radiography Systems	five years

120.398: Appendix D -- Operating and Emergency Procedures

The licensee's or registrant's operating and emergency procedures shall include instructions in at least the following:

- A. Handling and use of sources of radiation for industrial radiography such that no individual is likely to be exposed to radiation doses that exceed the limits established in 105 CMR 120.200;
- B. Methods and occasions for conducting radiation surveys, including lock-out survey requirements;
- C. Methods for controlling access to industrial radiography areas;
- D. Methods and occasions for locking and securing sources of radiation;
- E. Personnel monitoring and the use of personnel monitoring equipment, including steps to be taken immediately by industrial radiographic personnel in the event a pocket dosimeter is found to be off-scale as described in 105 CMR 120.323(B)(5);
- F. Methods of transporting equipment to field locations, including packing of sources of radiation in the vehicles, posting of vehicles, and controlling of sources of radiation during transportation (including applicable U.S. Department of Transportation requirements);
- G. Methods or procedures for minimizing exposure of individuals in the event of an accident, including procedures for a disconnect accident, a transportation accident, and loss of a sealed source;
- H. Procedures for notifying proper personnel in the event of an accident;
- I. Specific posting requirements;
- J. Maintenance of records (105 CMR 120.397: *Appendix C*); and,
- K. Inspection and maintenance of radiographic exposure devices, source changers, storage containers, transport containers, source guide tubes, crank-out devices, and radiation machines.